

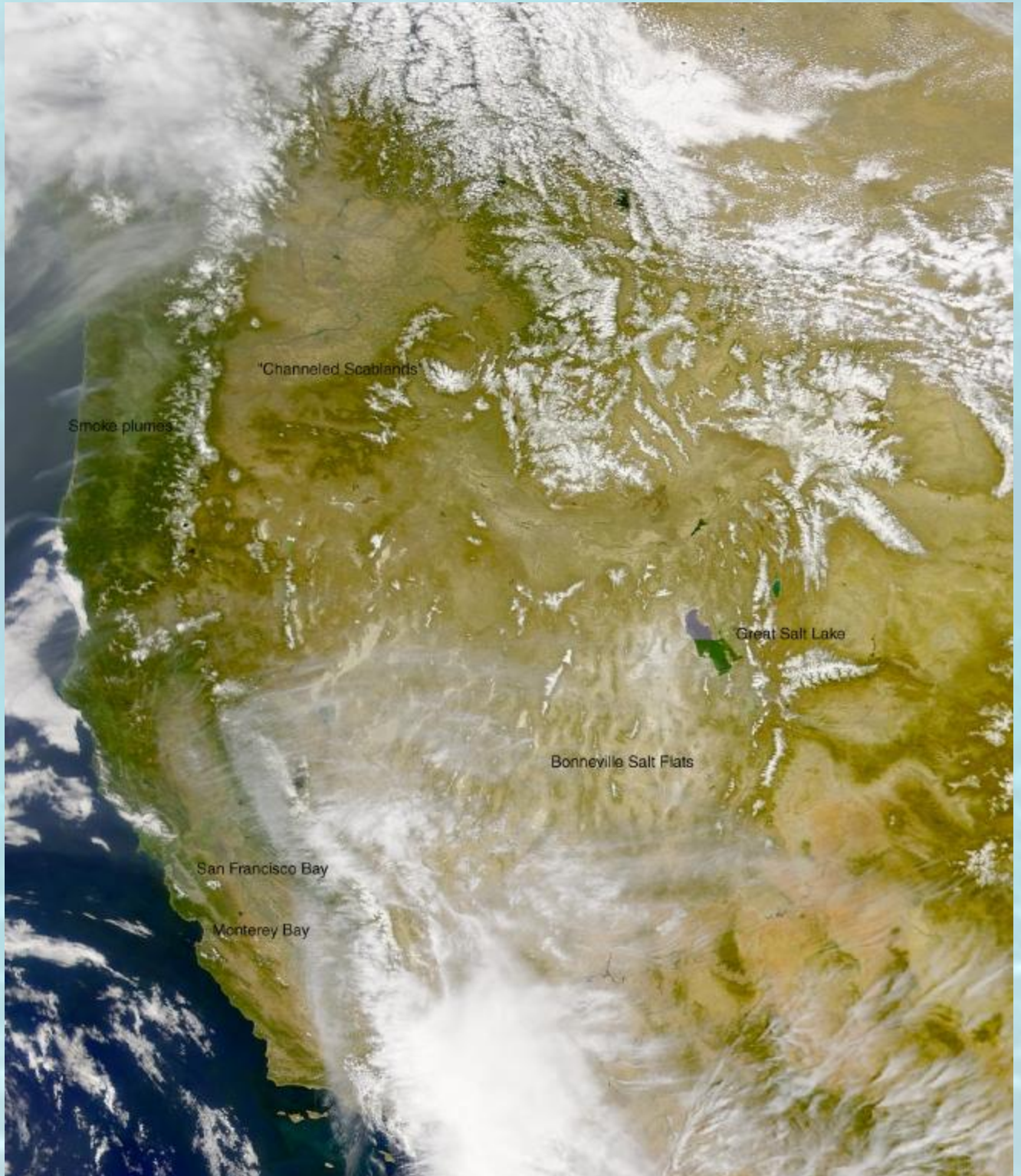
SCIENCE FOCUS: Salt Lakes and Pans

Ancient Seas, Modern Images



SeaWiFS image of the western United States. The features of interest that that will be discussed in this *Science Focus!* article are labeled on the large image on the next page. (Other features and landmarks are also labeled.)

It should be no surprise to be informed that the Sea-viewing Wide Field-of-view Sensor (SeaWiFS) was designed to observe the oceans. Other articles in the *Science Focus!* series have discussed various oceanographic applications of SeaWiFS data. However, this article discusses geological features that indicate the presence of seas that existed in Earth's paleohistory which can be discerned in SeaWiFS imagery.



SeaWiFS image of the western United States.

Great Salt Lake and Lake Bonneville



The Great Salt Lake is the remnant of ancient Lake Bonneville, which gave the Bonneville Salt Flats their name. Geologists estimate that Lake Bonneville existed between 23,000 and 12,000 years ago, during the last glacial period. Lake Bonneville's existence ended abruptly when the waters of the lake began to drain rapidly through Red Rock Pass in southern Idaho into the Snake River system (see "Lake Bonneville's Flood" link below). As the Earth's climate warmed and became drier, the remaining water in Lake Bonneville evaporated, leaving the highly saline waters of the Great Salt Lake. The reason for the high concentration of dissolved minerals in the Great Salt Lake is due to the fact that it is a "terminal basin" lake; water that enters the lake from streams and rivers can only leave by evaporation. As the process occurs over time, the dissolved substances in the river water become increasingly concentrated.

The reason that Great Salt Lake exhibits two distinctly different colors is due to both evaporation and the presence of a causeway that divides the lake and restricts circulation. Less water flows into the northern part of the lake than the southern part, making the northern part more saline than the southern part. Due to this difference in salinity, there are distinct populations of phytoplankton on either side of the causeway which have different colors.

Lake Bonneville/Great Salt Lake links:

[Pluvial Lake Bonneville](#)

[The Lake Bonneville Flood](#)

The "Channeled Scablands"

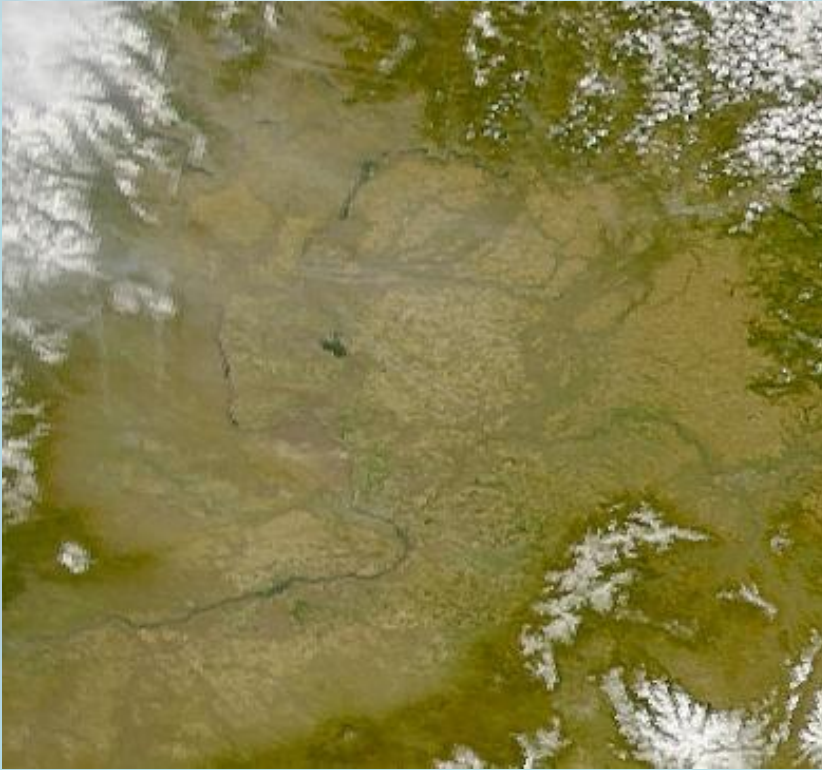


Image excerpt showing the "Channeled Scabland" region of eastern Washington State

Lake Bonneville was not the only ancient lake whose existence ended rather abruptly. Another ancient lake that experienced an abrupt and catastrophic end was Lake Missoula, located in the vicinity of the modern city of Missoula, Montana. Unlike Lake Bonneville, however, Lake Missoula occurred due to glacial meltwaters, and was formed due to a dam of ice which formed and broke repeatedly. Each time the dam broke, a huge flood of water burst from Lake Missoula and drained to the Pacific Ocean through eastern Washington State and the Columbia River gorge.

The evidence of the immense floods from Lake Missoula is clearly visible in the region

known as the "Channeled Scablands", shown in the image above. The drainage pattern is distinct and indicative of the forces that caused it. However, the origin of the "Channeled Scablands" was a geological controversy for many years, due to the reluctance of the geological community to accept a "catastrophic" explanation for the origin of the erosive features in this region. Geologist J Harlen Bretz (he didn't use a period after the "J") argued persuasively for this explanation of the geology in the "Channeled Scabland" region. The last piece of the puzzle, which convinced numerous geologists, was the discovery of the many shorelines of ancient Lake Missoula.

In an interesting twist, NASA scientists have used the geology of the "Channeled Scablands" to understand many of the erosive geological features observed on Mars.

Channeled Scabland links:

- [Ice Age Floods Institute](#)
- [Legacy: J Harlen Bretz \(1882 – 1981\)](#)

Uyuni Salt Plain (Salar de Uyuni)



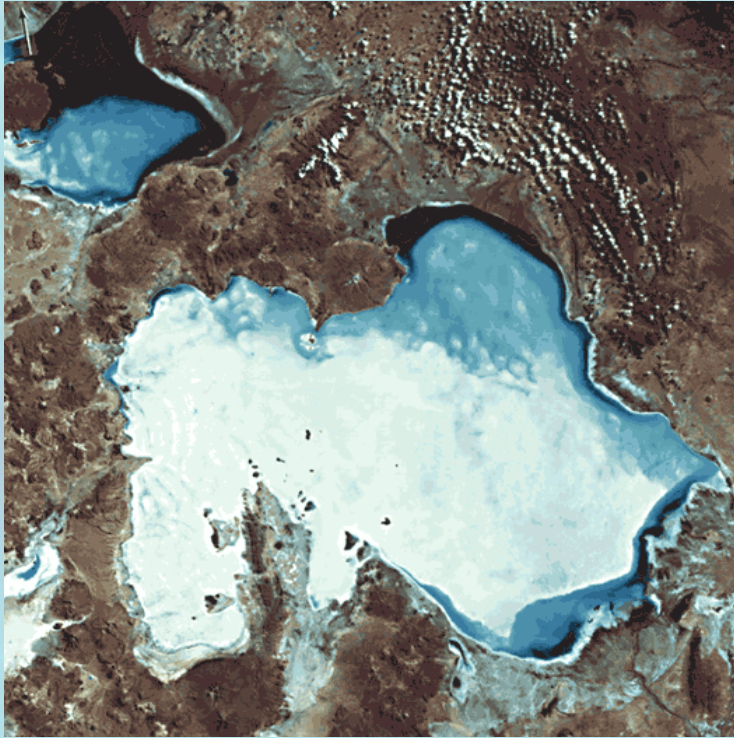
SeaWiFS image of western South America. Lake Titicaca is the body of water at the top of the image. The Uyuni salt plain is the large white area south of Lake Titicaca (arrow). The snow-capped peaks of the northern Andes mountains are visible in the southern part of the image.

The final destination in this tour of ancient lakes and seas is the Uyuni Salt Plain (Salar de Uyuni) in the altiplano of Bolivia. The Uyuni salt plain is thought to be the largest salt playa in the world, covering nearly 9000 square kilometers. Unless you know what it is, it's easy to mistake the Uyuni salt plain for something else, such as the snow on the peaks of the Andes mountains. But once you know where it is, it's hard to miss.

The origin of the Uyuni salt plain is similar to the origin of the Bonneville Salt Flats and the Great Salt Lake. During the late Pleistocene era of Earth's geological history, there were two lakes on the altiplano—Lago Ballivian (which covered the area of modern Lake Titicaca) and Lago Minchin, which contained the area of the Uyuni salt plain. However, unlike Lake Bonneville, Lago Minchin apparently just slowly dried up from 15,000 to 10,000 years ago, leaving the dissolved minerals within its waters to form the salt plain.

This slow drying period can be determined by geological examination of the surrounding rocks for an "evaporite sequence"—the minerals that form as water containing dissolved ions evaporates and becomes more concentrated. The first mineral to form is limestone (calcium carbonate), which is found on the margins of the salt plain and indicates that the lake was at least 100 meters deep at one time. The next stage of evaporation produces gypsum (calcium sulfate) and then halite (sodium chloride), also known as salt. The surface of the Uyuni salt plain contains gypsum and halite.

The Uyuni salt plain today is now a unique eco-tourist destination. One of its most unique aspects is a hotel that lies within it, the Hotel Play Blanca, offering vistas of the vast white plain in every direction, and one of the quietest places anywhere on Earth. One suggestion: bring your own water, as you might get thirsty.



Landsat image of the Uyuni salt plain (Salar de Uyuni)



This picture of a group of tourists and their bus on the Uyuni salt plain gives an idea of the vast size and sheer white vistas of this remarkable place.

Uyuni Salt Plain links

- [Salar de Uyuni, Bolivia](#)
- [Evaporites](#)
- [Evaporite Sequence \(image\)](#)
- [Palacio de Sal \(hotel\)](#)